

What is claimed:

1. A device for measuring element temperature of an air-fuel ratio sensor comprising:

a voltage application circuit for temporarily applying a predetermined voltage for measuring element temperature to a sensor element of said air-fuel ratio sensor equipped to an exhaust system of an internal combustion engine; and

an arithmetic circuit for reading in a sensor output just before applied with said voltage and a sensor output being applied with said voltage, and estimating the element temperature of said air-fuel ratio sensor based on said sensor output just before applied with the voltage and said sensor output being applied with the voltage.

2. A device for measuring element temperature of an air-fuel ratio sensor according to claim 1, wherein said arithmetic circuit estimates the element temperature of said air-fuel ratio sensor based on said sensor output being applied with the voltage, by using said sensor output just before applied with the voltage as a correction parameter.

3. A device for measuring element temperature of an air-fuel ratio sensor according to claim 1, wherein said arithmetic circuit corrects said sensor output being applied with the voltage based on said sensor output just before applied with the voltage, and estimates the element temperature of the air-fuel ratio sensor based on said corrected sensor output.

4. A device for measuring element temperature of an air-fuel ratio sensor according to claim 1, wherein said arithmetic circuit corrects said sensor output being applied with the voltage, computes the internal resistance of said sensor element based on said corrected sensor output, and computes the element temperature based on said computed internal resistance.

5. A device for measuring element temperature of an air-fuel ratio sensor according to claim 3, wherein said arithmetic circuit subtracts said sensor output just before applied with the voltage from said sensor output being applied with the voltage to compute the corrected sensor output.

6. A device for measuring element temperature of an air-fuel ratio sensor according to claim 1, wherein said arithmetic circuit computes the internal resistance of said sensor element based on said sensor output being applied with the voltage, corrects said computed internal resistance based on said sensor output just before applied with the voltage, and computes the element temperature based on said corrected internal resistance.

7. A device for measuring element temperature of an air-fuel ratio sensor according to claim 1, wherein said arithmetic circuit computes the internal resistance of said sensor element based on said sensor output being applied with the voltage, computes the element temperature based on said computed internal resistance, and corrects said computed element temperature based on said sensor output just before applied with the voltage.

8. A device for measuring element temperature of an air-fuel ratio sensor according to claim 1, wherein said arithmetic circuit reads in the sensor output at a predetermined cycle so as to detect an air-fuel ratio, and said voltage application circuit applies to the sensor element a predetermined voltage for measuring the element temperature immediately after reading in said sensor output.

9. A device for measuring element temperature of an air-fuel ratio sensor comprising:

element temperature measurement voltage application means for temporarily applying a predetermined voltage for element temperature measurement to a sensor element of said air-fuel ratio sensor equipped to an exhaust system of an internal combustion engine;

first sensor output reading means for reading in a sensor output just before applied with said voltage;

second sensor output reading means for reading in a sensor output being applied with said voltage; and

element temperature estimation means for estimating the element temperature of said air-fuel ratio sensor based on said sensor output just before applied with the voltage and said sensor output being applied with the voltage.

10. A device for controlling a heater of an air-fuel ratio sensor comprising:

a device for measuring element temperature of an air-fuel ratio sensor

according to claim 1; and

heater power supply amount control means for feedback controlling a power supply amount to said heater for heating a sensor element equipped to said air-fuel ratio sensor so that the element temperature reaches a target temperature.

11. A device for measuring element temperature of an air-fuel ratio sensor comprising:

a heater for heating a sensor element of said air-fuel ratio sensor equipped to an exhaust system of an internal combustion engine;

an internal resistance measurement circuit for measuring the internal resistance of said sensor element;

an arithmetic circuit for computing the element temperature based on said measured internal resistance, and computing a power supply amount to said heater for heating the sensor element based on said computed element temperature;

a heater control circuit for controlling said heater based on said computed power supply amount; and

a heater applied voltage control circuit for maintaining a voltage applied to said heater for heating the sensor element to be constant during internal resistance measurement of the sensor element.

12. A device for measuring element temperature of an air-fuel ratio sensor according to claim 11,

wherein said air-fuel ratio sensor is equipped with a Nernst cell portion for generating a voltage corresponding to the lean/rich of an air-fuel ratio, and a pump cell portion for being applied with a predetermined voltage in the direction corresponding to the lean/rich of the air-fuel ratio detected by said Nernst cell portion, to continuously vary the current value thereof corresponding to the air-fuel ratio; and

wherein said internal resistance measurement circuit measures the internal resistance of said Nernst cell portion based on the current value flowing through said Nernst cell portion when an alternating voltage is applied to said Nernst cell portion.

13. A device for measuring element temperature of an air-fuel ratio sensor according to claim 11,

wherein said heater control circuit controls the power supply amount to the

heater by performing a duty control of the ON/OFF of the power supply to the heater; and

wherein said heater applied voltage control circuit maintains the power supply to the heater to an OFF state during internal resistance measurement of said sensor element.

14. A device for measuring element temperature of an air-fuel ratio sensor according to claim 11,

wherein said heater control circuit controls the power supply amount to the heater by performing a duty control of the ON/OFF of the power supply to the heater; and

wherein said heater applied voltage control circuit maintains the power supply to the heater to an ON state during internal resistance measurement of said sensor element.

15. A device for measuring element temperature of an air-fuel ratio sensor according to claim 11,

wherein said heater applied voltage control circuit maintains the applied voltage to a voltage value set based on an engine rotation speed and a fuel injection quantity.

16. A device for measuring element temperature of an air-fuel ratio sensor comprising:

a heater for heating a sensor element of said air-fuel ratio sensor equipped to an exhaust system of an internal combustion engine;

internal resistance measurement means for measuring the internal resistance of said sensor element;

heater power supply amount computing means for detecting the sensor element temperature based on said measured internal resistance, to compute a power supply amount to said heater for heating the sensor element based on said detected element temperature;

heater control means for controlling said heater based on said computed heater power supply amount; and

heater applied voltage control means for maintaining a voltage applied to said heater for heating the sensor element to be constant during internal resistance measurement of the sensor element.

17. A method for measuring element temperature of an air-fuel ratio sensor comprising the steps of:

temporarily applying a predetermined voltage for measuring element temperature to a sensor element of said air-fuel ratio sensor equipped to an exhaust system of an internal combustion engine; and

reading in a sensor output just before applied with said voltage and a sensor output being applied with said voltage, and estimating the element temperature of said air-fuel ratio sensor based on said sensor output just before applied with the voltage and said sensor output being applied with the voltage.

18. A method for measuring element temperature of an air-fuel ratio sensor according to claim 17, wherein the element temperature of said air-fuel ratio sensor is estimated based on said sensor output being applied with the voltage, by using said sensor output just before applied with the voltage as a correction parameter.

19. A method for measuring element temperature of an air-fuel ratio sensor according to claim 17, wherein said sensor output being applied with the voltage is corrected based on said sensor output just before applied with the voltage, and the element temperature of the air-fuel ratio sensor is estimated based on said corrected sensor output.

20. A method for measuring element temperature of an air-fuel ratio sensor according to claim 17, wherein said sensor output being applied with the voltage is corrected based on said sensor output just before applied with the voltage, the internal resistance of said sensor element is computed based on said corrected sensor output, and the element temperature is computed based on said computed internal resistance.

21. A method for measuring element temperature of an air-fuel ratio sensor according to claim 19, wherein said sensor output just before applied with the voltage is subtracted from said sensor output being applied with the voltage to compute the corrected sensor output.

22. A method for measuring element temperature of an air-fuel ratio sensor according to claim 17, wherein the internal resistance of said sensor element is

computed based on said sensor output being applied with the voltage, said computed internal resistance is corrected based on said sensor output just before applied with the voltage, and the element temperature is computed based on said corrected internal resistance.

23. A method for measuring element temperature of an air-fuel ratio sensor according to claim 17, wherein the internal resistance of said sensor element is computed based on said sensor output being applied with the voltage, the element temperature is computed based on said computed internal resistance, and said computed element temperature is corrected based on said sensor output just before applied with the voltage.

24. A method for measuring element temperature of an air-fuel ratio sensor according to claim 17, wherein a predetermined voltage for measuring the element temperature is applied to the sensor element immediately after said sensor output just before applied with the voltage is read in, by an air-fuel ratio sensor for reading in the sensor output at a predetermined cycle.

25. A method for controlling a heater of an air-fuel ratio sensor comprising the steps of:

- measuring the element temperature by a method for measuring element temperature of an air-fuel ratio sensor according to claim 17; and

- feedback controlling a power supply amount to said heater for heating a sensor element equipped to said air-fuel ratio sensor so that the element temperature reaches a target temperature.

26. A method for measuring element temperature of an air-fuel ratio sensor comprising the steps of:

- measuring the internal resistance of a sensor element of said air-fuel ratio sensor equipped to an exhaust system of an internal combustion engine, computing the element temperature based on said measured internal resistance, and computing a power supply amount to a heater for heating the sensor element based on said computed element temperature; and

- maintaining a voltage applied to said heater for heating the sensor element to be constant during internal resistance measurement of the sensor element.

27. A method for measuring element temperature of an air-fuel ratio sensor according to claim 26,

wherein said air-fuel ratio sensor is equipped with a Nernst cell portion for generating a voltage corresponding to the lean/rich of an air-fuel ratio, and a pump cell portion for being applied with a predetermined voltage in the direction corresponding to the lean/rich of the air-fuel ratio detected by said Nernst cell portion, to continuously vary the current value thereof corresponding to the air-fuel ratio; and

wherein the internal resistance of said Nernst cell portion is measured based on the current value flowing through said Nernst cell portion when an alternating voltage is applied to said Nernst cell portion.

28. A method for measuring element temperature of an air-fuel ratio sensor according to claim 26,

wherein the power supply amount to the heater for heating the sensor element is controlled by performing a duty control of the ON/OFF of the power supply to the heater; and

wherein the power supply to the heater is maintained to an OFF state during internal resistance measurement of said sensor element.

29. A method for measuring element temperature of an air-fuel ratio sensor according to claim 26,

wherein the power supply amount to the heater for heating the sensor element is controlled by performing a duty control of the ON/OFF of the power supply to the heater; and

wherein the power supply to the heater is maintained to an ON state during internal resistance measurement of said sensor element.

30. A method for measuring element temperature of an air-fuel ratio sensor according to claim 26,

wherein a voltage applied to the heater is maintained to a voltage value set based on an engine rotation speed and a fuel injection quantity during internal resistance measurement of said sensor element.